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(54) Multiplexed signal transmission system

Übertragungssystem für multiplexierte Signale

Système de transmission pour signaux multiplexés

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Description

The present invention relates generally to a multiplexed signal transmission system, and more particularly, to a multiplexed signal transmission system which transmits/receives switching pulses, mode information such as recording mode, playback mode, etc. through the minimum number of channels to/from a plurality of magnetic heads and amplifiers mounted on a rotary head of a video tape recorder.

In a video tape recorder (hereinafter referred to as a VTR), video signals and audio signals are recorded or played back on/from a magnetic tape using a rotary head. Therefore, the rotary head is provided at a rotary substrate side of a rotary drum. As is well known, a rotary transformer is used to transmit signals to this rotary head from a stationary circuit substrate section or from the rotary substrate section to the stationary substrate section. Recently, the functions of VTRs have advanced, and there are VTRs which are capable of performing not only regular recording/playback operations simply using two rotary heads but also trick plays provided with many rotary heads. In addition, such a system has been developed not only for recording/playback of video signals by a video rotary head but also for audio signal recording/playback on the same tracks as video tracks.

As a result, rotary transformers provided with many transmission channels have come into use and costs have become expensive, resulting in an increase in the cost, of the entire VTR set . In addition, as various rotary heads have become selectable according to VTR specifications, rotary transformers have been demanded to have corresponding specifications and the number of models has increased, impeding their standardization.

To solve such a problem, a new system has been developed to reduce the number of channels of a rotary transformer and standardize rotary transformers by incorporating amplifiers for amplifying playback signals of heads, a head selector switch for selecting over these amplifiers and a recording system distribution switch on a rotary substrate in the rotary drum.

For instance, this system has been proposed in "Head Switcher System for Consumer VCR", Digest of Technical Papers, ICCE; June 6-8 1990; pp 96-97; Y. Hanaoka et al. In this system, a head switching signal for controlling a head selector switch provided on the rotary head section and such mode information as recording, playback, etc. are multiplexed and transmitted to the rotary head section through single channel. That is, the head switching signal edge information is FM modulated and this FM wave is AM modulated to single channel signal according to the mode information, making it possible to transmit a plurality of control signals through single channel.

There are two head switching signals, i.e., a video head switching signal VSWP for switching the video head channels CH1 and CH2 and an audio head switching signal ASWP for switching the audio head channels CH1 and CH2. Normally, the mutual phase relation of these selector signals VSWP and ASWP is always kept constant. Further, when a control by a well known double azimuth four heads system is performed, a head amplifier switching signal HASW for switching a pair of SP heads and a pair of EP heads also becomes necessary. When a trick play in the SP mode is carried out by paying attention to this amplifier switching signal, the phase of this amplifier switching signal is variable. In addition, as mode information, not only the recording mode and the playback mode but also a trick play mode, head configuration information, etc. become necessary.

However, according to a conventional multiplexed signal transmission system, FM waves are AM modulated according to mode information, but the resolution of AM modulation level is restricted on the system, and thus the multiplexing becomes difficult. Therefore, only binary mode information showing the playback mode can be transmitted at the most and the system is inferior in expandability. Further, the phase of the head amplifier switching signal HASW varies in potential level as described above, and means for transmitting such phase information simultaneously with this signal is demanded. Furthermore, if an FM demodulator at the rotary head section fluctuates, the DC level after demodulation may fluctuate and a malfunction can be caused.

As described above, a conventional rotary head amplifier system is restricted in transmission of many control signals and inferior in flexibility and therefore, a system which is capable of transmitting many kinds of control signals and providing a stable and efficient operation has been demanded.

Further, a video multi VTR with a head almost the same width as the track pitch (19μm) (hereinafter referred to as a narrow head) added in order to further promote a picture quality in the three-times mode (EP mode) and a Hi-Fi multi VTR (two kinds of paired Hi-Fi heads are required to satisfy the VHS Hi-Fi standard) which is capable of high fidelity recording/playback of all television signals of NTSC/PAL/SECAM color television systems,have been proposed in recent years. In such VTRs it becomes an important factor that many kinds of control signals described above can be transmitted accurately in fewer channels to the rotary head section.

However, the multi-head system has not been sufficiently carried out for a conventional rotary head amplifier system. For instance, in the case of a Hi-Fi VTR, it is necessary to reduce switching noise which is generated when switching a narrow head and an EP normal head, that is, the system switching of multi-head system but no countermeasure was carried out for reducing switching noise.

Here, a general consideration of a method for reducing head system switching noise of a multi-head system will be explained with reference to a video multi system.

FIGURE 4(A) shows an example of the head arrangement of a video multi system similar to that disclosed in the paper "Head Switcher System for Consumer VCR" mentioned earlier. A1/A2 are Hi-Fi heads, S1/E2 and S2/E1 are conventional double azimuth four-heads, and N1/N2 are EP narrow heads. A timing chart for changing the head system from, for instance, E1 to N1 in this system is shown in a set of FIGURES 4(B). In FIGURE 4(B), FIGURE 4(B)(a) is a Hi-Fi head switching signal ASWP, FIGURE 4(B)(b) is a video head switching signal VSWP, FIGURE 4(B)(c) is an equivalent EP head switching signal EPSWP, FIGURE 4(B)(d) is a narrow head switching signal NSWP AND FIGURE 4(B)(e) is a head system switching information. In these timing charts of FIGURE 4(B), if the head system is switched during the indicated overlap period, head switching noises can be almost suppressed without causing the lack of playback signals as both E1 and N1 are kept in contact with a recording tape. In the rotary head amplifier system it is also necessary to transmit head system switching information to the rotary section during the similar period but no countermeasure has been made.

As described above, a conventional rotary head amplifier system is restricted in transmission of many control signals and inferior in flexibility and therefore, a system which is capable of transmitting many kinds of control signals and providing a stable and efficient operation has been demanded.

Further, when the rotary head amplifier system is applied to a multi-head VTR, if it is intended to transmit a head system switching information in addition to various switch selector signals and mode information, no sufficient measure has been provided to set the timing for the switching at a position where no noise is generated.

The present invention therefore seeks to provide a multiplexed signal transmission and receiving apparatus which is capable of transmitting many control signals accurately and stably through a single channel.

The present invention also seeks to provide a multiplexed signal transmission and receiving apparatus which is capable of easily transmitting head system switching information when transmitting various switch selector signals and mode information, setting a head system switching timing at a position where no noise is generated and is applicable to both video multi system and Hi-Fi multi system.

According to one aspect of the present invention, there is provided a multiplexed signal transmission system comprising:

means for receiving a first group of square pulses having a fixed phase relation to each other;

characterised in that the system further comprises:

means for generating edge pulse trains containing all edges extracted from the square pulses in the phase sequence;

means for generating edge attribute information representing an attribute of edge following after a prescribed edge in the same edge pulse train;

means for converting a plurality of parallel data comprising the edge attribute information and mode information for controlling a system status into a serial data;

means for aligning the serial data corresponding to the edge pulses after the edge pulses;

means for generating a four-level signal having a reference signal level, a first level associated with clocks for the serial data, a second level associated with the serial data superposed on the clock and a third level associated with the edge pulses; and

means for generating a transmission multiplexed signal by frequency modulation of the four-level signal.

According to a second aspect of the present invention, there is provided a multiplexed signal receiving system comprising:

means for receiving a multiplexed signal transmitted from a transmission section;

characterised in that the system comprises:

means for demodulating a four-level signal from the received multiplexed signal by frequency demodulation;

means for decoding serial data and an edge pulse train from the four-level signal;

means for reproducing edge attribute information and mode information using the serial data; and

means for reproducing square pulses constructing a first group of square pulses using the edge attribute information.

In addition to the above construction, the above aspects of the present invention can includes a detector for detecting edges of at least one square pulse of the group of the square pulses, and an extractor for extracting head switching information in the reproduced mode information at a timing of detecting the edges during an overlapping period of head systems.

For a better understanding of the present invention and many of the attendant advantages thereof reference will now be made by way of example to the accompanying drawings, wherein:

FIGURE 1 is a block diagram showing a first embodiment of the multiplexed signal transmission system according to the present invention;

FIGURE 2 is a timing chart for explaining the operations of the system shown in FIGURE 1;

FIGURE 3 is a block diagram showing a second em-

bodiment of the multiplexed signal transmission system according to the present invention;

FIGURE 4 is a head system diagram and a timing chart shown for explaining an example of the operation of the system shown in FIGURE 3; and

FIGURE 5 is a block diagram showing a third embodiment of the multiplexed signal transmission system according to the present invention.

The present invention will be described in detail with reference to the FIGURES 1 through 5. Throughout the drawings, like or equivalent reference numerals or letters will be used to designate like or equivalent elements for simplicity of explanation.

Referring now to FIGURES 1 and 2, a first embodiment of the multiplexed signal transmission system according to the present invention will be described in detail. FIGURE 1 shows a transmission section and a receiving section of the multiplexed signal transmission system, e.g., a stationary section and a rotary drum section of a VTR. FIGURE 2 shows a signal waveform diagram for explaining the operation of the system shown in FIGURE 1. In FIGURE 1, a video head switching signal VSWP is supplied to an input terminal 11 and an audio head switching signal ASWP is supplied to an input terminal 12. Further, a plurality of mode data are supplied to an input terminal 13 while a head amplifier selecting signal HASW is supplied to an input terminal 14.

The video head switching signal VSWP and the audio head switching signal ASWP are input to an edge pulse train detector 21 and an edge attribute detector 22. The edge pulse train detector 21 outputs an edge pulse train, with a combination of all edges of a switching signal extracted in a phase sequence, to a serial transfer sequencer 23 and a four-level signal generator 25. Further, video edge pulse VE and audio edge pulse AF are supplied to the edge attribute detector 22. The edge attribute detector 22 is capable of predicting which signal's edge will come arise and how polarity changes by utilizing the conditions that mutual phase relation between the video head switching signal VSWP and the audio head switching signal ASWP is kept constant and that it is possible to specify a current edge within signal's edges. Based on this prediction, attribute information (polarity) of the following edge is generated and supplied to a parallel-serial converter 24 as edge attribute information (for instance, 2-bit parallel data). Mode information (for instance, 4-bit parallel data) from the input terminal 13 has been given to the parallel-serial converter 24.

The parallel-serial converter 24 has been supplied with a timing signal from the serial transfer sequencer 23 and outputs serial data based on this timing signal. This serial data is supplied to the four-level signal generator 25. Serial clocks from the serial transfer sequencer 23 and edge pulse trains from the edge pulse train detector 21 have also been supplied to the four-level signal generator 25.

Here, the video head switching signal VSWP, audio head switching signal ASWP, edge pulse train, serial data and serial clock will be explained with reference to FIGURE 2.

FIGURES 2(A) and 2(B) represent the video head switching signal VSWP and the audio head switching signal ASWP, respectively. These switching signals VSWP and ASWP are always kept in constant phase relation to each other. Pulses C1 in FIGURE 2(C) are edge pulses representing the edge timings of the switching signals VSWP and ASWP extracted therefrom in a phase sequence. Then, following the edge pulses C1, serial data SD are arranged. In the example in FIGURE 2, the data SD are each constructed as 6-bit serial data. A set of the first four bits of this serial data SD represents a mode information MD and a set of the later two bits represents an edge attribute data AD. These bits of data have been superposed on respective clocks.

The attribute data AD will be explained in detail below. This attribute data AD represents a polarity of the next coming edge by its contents. In the case of the example shown in FIGURE 2, it shows the phase relation that the edge of the positive audio head switching signal ASWP comes next to the edge of the positive video head switching signal VSWP, the edge of the negative video head switching signal VSWP comes next to the edge of the positive audio head switching signal ASWP and further, the edge of the positive video head switching signal VSWP comes next to the edge of the negative audio head switching signal ASWP.

Further, in the four-level signal generator 25, the following relation has been set for the edge pulse train, serial data and clock level. That is, clock has been set at a first level L1 against the reference level Lr, serial data superposed on this clock has been set at a second level L2, the edge pulse at a third level L3, and the entirety of these levels have formed the four-level signal.

The four-level signal thus obtained is frequency modulated (FM) at a frequency modulator 26 and this FM wave is further supplied to an amplitude modulator 27, where the FM wave is amplitude modulated (AM) by a head amplifier switching signal HASW and is transmitted as a multiplexed signal through a single channel coupled to an output terminal 28 of the transmitter section.

Now, a system for demodulating the multiplexed signal transmitted as described above will be explained.

The multiplexed signal is introduced into an input terminal 31 and supplied to an amplitude demodulator 32 and a frequency demodulator 33. From the amplitude demodulator 32, a playback head amplifier switching signal HASW can be obtained. Further, a playback four-level signal can be obtained from the frequency demodulator 33. This four-level signal is supplied to a clamper 34 and the reference level (the minimum potential) is reproduced for stabilizing the next decoding process. The clamper 34 requires a capacitor but as the minimum potential period is long, a capacitor of low capacitance

is sufficient and this makes it easy to incorporate a capacitor when integrating the clamper 34. The output of this clamper 34 (four-level signal) is supplied to a four-level signal decoder 35. In this decoder 35, an edge pulse train is reproduced in response to the four levels and it is possible to play back serial data SD (the former part mode information MD and the latter part edge attribute data AD) and a clock signal. The serial data SD (including the mode information MD and the edge attribute data AD) is supplied to a serial-parallel converter 36. The serial-parallel converter 36 separates the mode information MD and the edge attribute data AD based on the clock and supplies the parallel converted edge attribute data AD to a square pulse regenerator 37 and the parallel converted mode information MD to a synchronizer 38. In the square pulse regenerator 37, the video head switching signal VSWP and the audio head switching signal ASWP are regenerated using the edge attribute data and edge pulse train. The synchronizer 38 outputs the mode information in synchronism with the edge pulse train as a system status switching signal. FIGURE 2(D) shows that mode information M0, M1, M2, and so on were sent out.

The system described above is capable of transmitting various mode data and even when there exist many rotary heads, playback amplifiers, recording amplifiers, etc. on the rotary substrate section, is capable of transmitting these control data. Video head and audio head switching signals are not limited to only one set but can be combined in many sets. Further, in the trick play, outputs of a plurality of heads are selectively led out. In this case, the head output selection timing phase is not kept constant but is optionally selectable. Therefore, the head amplifier switching signal HASW can be transmitted successively with its output phase sequence determined in advance according to the trick play and by supplying it to the AM modulator. It is possible to hold mode information at the rotary substrate section and when clearing then, it can be controlled using the serial data. The rotary substrate section mode information using method can be freely designed according to functions and configurations of rotary head apparatus. Therefore, in the above embodiment, when square pulse edges were extracted in phase sequence, all edges were extracted. However, it is not necessary to extract all edges if the sequence or time is as set in advance. In addition, although the frequency modulated signal is to be transmitted after amplitude modulation by the second square pulse in the embodiment, the frequency modulated signal may be transmitted as it is.

Further, when transmitting the four-level signal, even if the FM demodulator fluctuates, decoding error in the decoder can be eliminated by clamping the demodulated output as the minimum potential has been set. Further, the power supply to the rotary substrate section may be made by, for instance, a transmission means using a slip ring. In addition, in the example shown in the figure, it is shown to transmit serial data immediately after edge pulses. It is however sufficient to complete transfer of related serial data between respective edge pulses. However, transfer of serial data must be completed before arrival of the following edge and many more data can be transmitted when the transfer is started immediately after the edge pulses. Further, the reference level may be set in the section where no serial data exist although, in the above explanation, it was explained that the reference level is present in the serial data section.

Referring now to FIGURES 3 and 4, a second embodiment of the multiplexed signal transmission system according to the present invention will be described.

In FIGURE 3, the same reference numerals have been assigned to the same parts as in FIGURE 1. Those parts differing from the embodiment in FIGURE 1 will be explained. In the receiving section, the audio head switching signal ASWP from the square pulse regenerator 37 is further led to a both ends edges detector 40. The edge pulse detected in the both ends edges detector 40 is supplied to the synchronous pulse input terminal of a synchronizer 39. To an input terminal of the synchronizer 39, the data output terminal of the serial-parallel converter 36 is connected. Head system switching information is led to this data output terminal. This head system switching information is supplied to the head system switching system through the synchronizer 39 at the center of the head system overlap period.

FIGURE 4(A) shows an example of the video multi-system heads arrangement. A1/A2 are the Hi-Fi heads, S1/E2 and S2/E1 are the double azimuth four heads, and N1/N2 are the EP narrow heads. The timing chart for changing the head systems, for instance, from E1 to N1 in this system is shown in FIGURE 4(A). In FIGURE 4(B), (a) is the Hi-Fi head switching signal ASWP, (b) is the video head switching signal VSWP, (c) is the EP head switching signal EPSWP, (d) is the narrow head switching signal NSWP and (e) is the head system switching information. In this timing chart, if the head system is switched during the indicated overlap period, head switching noise can be almost suppressed without causing lack of any portion of playback signal as both E1 and N1 are kept in contact with a recording tape.

Now, an example for transmission and receiving of the head system switching information will be explained. First, when transmitting the head system switching information from the stationary section, the head system switching information is transmitted (prepared) in the corresponding switching signal period (the E2 head active period in FIGURE 4) before the overlap period. There are two periods for this transmission. That is, one is a prescribed period from the leading edge of the audio head switching signal ASWP and the other is a prescribed period from the trailing edge of the video head switching signal VSWP. Even when the head system switching information is transmitted in either period, the head system switching information output timing will agree with the failing time of the audio head switching

signal ASWP at the rotary section because the synchronizer 39 has been provided. Whenever the head system switching information is output in synchronization with this falling edge, the point of time for switching exists at the center of the overlap period as illustrated in FIGURE 4.

In this embodiment, the head system switching information is output in synchronism with the edge of the audio head switching signal ASWP by the synchronizer 39. So, the head system switching information preparatory period at the transmission section can be any period out of the half period of the video head switching signal VSWP. Therefore, a microcomputer which, generating the head system switching information at the receiving section and sending it to the serial-parallel converter 24, increases the degree of freedom for its transfer time. Thus, the head system switching information is output at a proper point of time at the rotary section.

FIGURE 5 illustrates the third embodiment of the present invention.

In this embodiment, the apparatus of the present invention is applicable to both the video multi-system and the Hi-Fi multi-system. This embodiment is almost the same as the second embodiment illustrated in FIGURE 3 and the same signs have been assigned to the same parts. What are differing from those in the second embodiment shown in FIGURE 3 are that the audio head switching signal ASWP and the video head switching signal VSWP have been connected to respective input terminals of a selector 41,
and the selected output of this selector 41 is supplied to the both ends edges detecting circuit 40. The selector 41 selects the audio head switching signal ASWP when switching the video head systems, and selects the video head switching signal VSWP when switching the audio head systems. Thus, when switching the video head systems and the audio head systems, any head system is selectable at the center of respective overlap periods.

Further, in this case the control signal of the selector 41 may be transmitted through the information route from the rotary section or it may be preset in advance at the rotary section according to the head system (the video multi-system, the Hi-Fi multi-system). The stationary section and the rotary section circuits have been composed of integrated circuits, respectively and can be used as highly flexible systems.

As described above, according to the present invention it is possible to transmit many control signals accurately and stably through single channel and the degree of freedom can be further expanded. In addition, it is also possible to output the head system switching information at a proper timing (at the center of the overlap period) at the rotary section in the multi-heads system, suppressing generation of switching noise. However, a timing to transmit the head system switching information from the stationary section is not subject to a severe restriction but it is possible to give a margin to a data output timing program of a microcomputer, etc. at the transmission section. Further, if the rotary section and the stationary section have been integrated on a single chip, the circuit of the present invention will have an extremely high adaptability to various rotary head systems.

As described above, the present invention can provide an extremely preferable multiplexed signal transmission system.

While there have been illustrated and described what are at present considered to be preferred embodiments of the present invention, it will be understood by those skilled in the art that various changes and modifications may be made, and equivalents may be substituted for elements thereof without departing from the scope of the present invention as defined in the appended claims. In addition, many modifications may be made to adapt a particular situation or material to the teaching of the present invention without departing from the scope thereof. Therefore, it is intended that the present invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out the present invention, but that the present invention include all embodiments falling within the scope of the appended claims.

Claims

1. A multiplexed signal transmission system comprising:

   means (11, 12) for receiving a first group of square pulses having a fixed phase relation to each other;

   characterised in that the system further comprises:

   means (21) for generating edge pulse trains containing all edges extracted from the square pulses in the phase sequence;
   means (22) for generating edge attribute information representing an attribute of edge following after a prescribed edge in the same edge pulse train;
   means (24) for converting a plurality of parallel data comprising the edge attribute information and mode information for controlling a system status into a serial data;
   means (23) for aligning the serial data corresponding to the edge pulses after the edge pulses;
   means (25) for generating a four-level signal having a reference signal level, a first level associated with clocks for the serial data, a second level associated with the serial data superposed on the clock and a third level associated with the edge pulses; and

means (26) for generating a transmission multiplexed signal by frequency modulation of the four-level signal.

2. A multiplexed signal transmission system as claimed in claim 1, wherein the four-level signal generating means (25) comprises means for setting up a level period in which there exists no serial data that becomes the reference for four-level signal between the serial data arrangement and following edge pulse.

3. A multiplexed signal transmission system as claimed in claim 1, further comprising means (27) for obtaining multiplexed signals to be transmitted by further modulating the frequency modulated signals by a second square pulse.

4. A multiplexed signal transmission system as claimed in claim 3, wherein the first group of square pulses contains a video head switching signal and an audio head switching signal, the second square pulse contains information for switching head amplifiers provided on the rotary head section substrate of a video tape recorder, and wherein the mode information contains information for switching various switches provided on the rotary head section substrate.

5. A multiplexed signal transmission system as claimed in any preceding claim, characterised in that the parallel data comprise the edge attribute information and mode information including switching information for switching head systems of a multi-head system.

6. A multiplexed signal transmission system as claimed in claim 5, wherein at least one of the square pulses has a video head switching signal, and wherein the multi-head system has an audio multi-head system.

7. A multiplexed signal transmission system as claimed in claim 5 or 6, wherein at least one of the square pulses has an audio head switching signal, and wherein the multi-head system has a video multi-head system.

8. A multiplexed signal transmission system as claimed in claim 5, wherein the square pulses have a video head switching signal and an audio head switching signal which are selectively supplied to the means for generating edge pulse trains.

9. A multiplexed signal receiving system comprising:

means (31) for receiving a multiplexed signal transmitted from a transmission section;

characterised in that the system comprises:

means (33, 34) for demodulating a four-level signal from the received multiplexed signal by frequency demodulation;
means (35) for decoding serial data and an edge pulse train from the four-level signal;
means (36) for reproducing edge attribute information and mode information using the serial data; and
means (37) for reproducing square pulses constructing a first group of square pulses using the edge attribute information.

10. A multiplexed signal receiving system as claimed in claim 9, wherein the four-level signal demodulating means comprises means (34) for generating a reference level by clamping a level during a period in which there exists no serial data of the frequency demodulated four-level signal to a constant level.

11. A multiplexed signal receiving system as claimed in claim 9, further comprising means for extracting a second square pulse by amplitude demodulation of the received signal.

12. A multiplexed signal receiving system as claimed in claim 11, wherein the first group of square pulses contains a video head switching signal and an audio head switching signal, the second square pulse contains information for switching head amplifiers provided on the rotary head section substrate of a video tape recorder, and wherein the mode information contains information for switching various switches provided on the rotary head section substrate.

13. A multiplexed signal receiving system as claimed in one of claims 9 to 12, further comprising:

means for detecting at least one square pulse edge out of the above square pulses; and
means for outputting the information for switching various switches, contained in the reproduced mode information, at an edge detecting timing in a multi-head system overlap period.

14. A multiplexed signal receiving system as claimed in claim 13, wherein at least one of the square pulses has a video head switching signal, and wherein the multi-head system has an audio multi-head system.

15. A multiplexed signal receiving system as claimed in claim 13 or 14, wherein at least one of the square pulses has an audio head switching signal, and the multi-head system has a video multi-head system.

16. A multiplexed signal receiving system as claimed in

claim 13, wherein the square pulses have a video head switching signal and an audio head switching signal which are selectively supplied to the edge detection means.

Patentansprüche

1. Multiplexsignal-Übertragungssystem, umfassend:

   Vorrichtungen (11, 12) zum Empfangen einer ersten Gruppe von Rechteckimpulsen, die untereinander eine feste Phasenbeziehung aufweisen,

   dadurch gekennzeichnet, daß das System zudem umfaßt:

   eine Vorrichtung (21) zum Erzeugen vom Flankenimpulsfolgen, die alle Flanken enthalten, die aus den Rechteckimpulsen in der Phasenfolge entnommen wurden;
   eine Vorrichtung (22) zum Erzeugen von Flankenattributinformation, die ein Attribut einer Flanke darstellt, die nach einer vorgeschriebenen Flanke in der gleichen Flankenimpulsfolge folgt;
   eine Vorrichtung (24) zum Umsetzen einer Anzahl paralleler Daten, die die Flankenattributinformation umfassen und Modusinformation zum Steuern eines Systemstatus, in serielle Daten;
   eine Vorrichtung (23) zum Ausrichten der seriellen Daten, die den Flankenimpulsen entsprechen, nach den Flankenimpulsen;
   eine Vorrichtung (25) zum Erzeugen eines Vierpegelsignals, das aufweist: einen Bezugssignalpegel, einen ersten Pegel, der zu den Takten für die seriellen Daten gehört, einen zweiten Pegel, der zu den seriellen Daten gehört, die dem Takt überlagert werden, und einem dritten Pegel, der zu den Flankenimpulsen gehört; und
   eine Vorrichtung (26) zum Erzeugen eines Übertragungsmultiplexsignals durch Frequenzmodulation des Vierpegelsignals.

2. Multiplexsignal-Übertragungssystem nach Anspruch 1, wobei die Erzeugungsvorrichtung (25) für das Vierpegelsignal eine Einrichtung zum Einstellen einer Pegelperiode enthält, in der keine seriellen Daten existieren, und die der Bezug des Vierpegelsignals zwischen der seriellen Datenanordnung und den folgenden Flankenimpulsen wird.

3. Multiplexsignal-Übertragungssystem nach Anspruch 1, ferner umfassend eine Einrichtung (27) zum Ermitteln von zu übertragenden Multiplexsignalen durch weiteres Modulieren der frequenzmodulierten Signale mit einem zweiten Rechteckimpuls.

4. Multiplexsignal-Übertragungssystem nach Anspruch 3, wobei die erste Gruppe Rechteckimpulse ein Videokopf-Umschaltsignal und ein Audiokopf-Umschaltsignal enthält, und der zweite Rechteckimpuls Information zum Umschalten der Kopfverstärker enthält, die auf dem sich drehenden Kopfträgerabschnitt eines Videorecorders bereitgestellt sind, und wobei die Modusinformation Information zum Schalten verschiedener Schalter enthält, die auf dem sich drehenden Kopfträgerabschnitt bereitgestellt sind.

5. Multiplexsignal-Übertragungssystem nach irgendeinem vorhergehenden Anspruch, dadurch gekennzeichnet, daß die parallelen Daten die Flankenattributinformation und die Modusinformation einschließlich der Schaltinformation zum Schalten der Kopfsysteme eines Mehrkopfsystems enthält.

6. Multiplexsignal-Übertragungssystem nach Anspruch 5, wobei mindestens einer der Rechteckimpulse ein Videokopf-Umschaltsignal aufweist, und wobei das Mehrkopfsystem ein Audio-Mehrkopfsystem besitzt.

7. Multiplexsignal-Übertragungssystem nach Anspruch 5 oder 6, wobei mindestens einer der Rechteckimpulse ein Audiokopf-Umschaltsignal aufweist, und wobei das Mehrkopfsystem ein Video-Mehrkopfsystem besitzt.

8. Multiplexsignal-Übertragungssystem nach Anspruch 5, wobei die Rechteckimpulse ein Videokopf-Umschaltsignal und ein Audiokopf-Umschaltsignal aufweisen, die ausgewählt in die Vorrichtung zum Erzeugen der Flankenimpulsfolge eingespeist werden.

9. Multiplexsignal-Empfangssystem, umfassend:

   eine Vorrichtung (31) zum Empfangen eines Multiplexsignals, das von einem Sendeabschnitt übertragen wird,

   dadurch gekennzeichnet, daß das System umfaßt:

   Vorrichtungen (33, 34) zum Demodulieren eines Vierpegelsignals aus dem empfangenen Multiplexsignal durch Frequenzdemodulation;
   eine Vorrichtung (35) zum Decodieren serieller Daten und einer Flankenimpulsfolge aus dem Vierpegelsignal;
   eine Vorrichtung (36) zum Reproduzieren der Flankenattributinformation und der Modusin-

formation mit Hilfe der seriellen Daten; und eine Vorrichtung (37) zum Reproduzieren der Rechteckimpulse, die mit Hilfe der Flankenattributinformation eine erste Gruppe Rechteckimpulse aufbaut.

10. Multiplexsignal-Empfangssystem nach Anspruch 9, wobei die Vierpegelsignal-Demoduliervorrichtung eine Vorrichtung (34) zum Erzeugen eines Bezugspegels umfaßt, und zwar durch das Festhalten eines Pegels auf einem konstanten Wert während einer Periode, in der keine seriellen Daten des frequenzdemodulierten Vierpegelsignals existieren.

11. Multiplexsignal-Empfangssystem nach Anspruch 9, zudem umfassend eine Einrichtung zum Entnehmen eines zweiten Rechteckimpulses durch Amplitudendemodulation des empfangenen Signals.

12. Multiplexsignal-Empfangssystem nach Anspruch 11, wobei die erste Gruppe Rechteckimpulse ein Videokopf-Umschaltsignal enthält und ein Audiokopf-Umschaltsignal, und der zweite Rechteckimpuls Information zum Schalten der Kopfverstärker enthält, die auf dem sich drehenden Kopfträgerabschnitt eines Videorecorders bereitgestellt sind, und wobei die Modusinformation Information zum Schalten verschiedener Schalter enthält, die auf dem sich drehenden Kopfträgerabschnitt bereitgestellt sind.

13. Multiplexsignal-Empfangssystem nach irgendeinem der Ansprüche 9 bis 12, ferner umfassend:

eine Vorrichtung zum Erkennen mindestens einer Rechteckimpulsflanke aus den obigen Rechteckimpulsen; und
eine Vorrichtung zum Ausgeben der Information zum Schalten verschiedener Schalter, die in der reproduzierten Modusinformation enthalten ist, bei einem Flankenerkennungs-Timing in einer Mehrkopfsystem-Überlappungsperiode.

14. Multiplexsignal-Empfangssystem nach Anspruch 13, wobei mindestens einer der Rechteckimpulse ein Videokopf-Umschaltsignal aufweist, und wobei das Mehrkopfsystem ein Audio-Mehrkopfsystem besitzt.

15. Multiplexsignal-Empfangssystem nach Anspruch 13 oder 14, wobei mindestens einer der Rechteckimpulse ein Audiokopf-Umschaltsignal aufweist, und wobei das Mehrkopfsystem ein Video-Mehrkopfsystem besitzt.

16. Multiplexsignal-Empfangssystem nach Anspruch 13, wobei die Rechteckimpulse ein Videokopf-Umschaltsignal und ein Audiokopf-Umschaltsignal aufweisen, die ausgewählt in die Flankenerkennungsvorrichtung eingespeist werden.

Revendications

1. Un système de transmission pour signaux multiplexés comprenant :

des moyens (11, 12) pour recevoir un premier groupe d'impulsions carrées présentant une relation de phase fixe l'une par rapport à l'autre ;

caractérisé en ce que le système comprend en outre :

des moyens (21) pour produire des trains d'impulsions de flanc contenant tous les flancs extraits des impulsions carrées de la séquence de phase ;

des moyens (22) pour produire des informations d'attribut de flanc représentant un attribut de flanc suivant un flanc prescrit du même train d'impulsions de flanc ;

des moyens (24) pour convertir un ensemble de données parallèles comprenant les informations d'attribut de flanc et les informations de mode pour commander un état de système en données série ;

des moyens (23) pour aligner les données série correspondant aux impulsions de flanc après les impulsions de flanc ;

des moyens (25) pour produire un signal à quatre niveaux présentant un niveau de signal de référence, un premier niveau associé à des impulsions d'horloge pour les données série, un second niveau associé aux données séries superposées aux impulsions d'horloge et un troisième niveau associé aux impulsions de flanc ; et

des moyens (26) pour produire un signal multiplexé de transmission par modulation de fréquence du signal à quatre niveaux.

2. Un système de transmission pour signaux multiplexés tel que revendiqué à la revendication 1, dans lequel les moyens (25) de production du signal à quatre niveaux comprennent des moyens pour établir une période de niveaux dans laquelle il n'existe aucune donnée série qui devient la référence pour le signal à quatre niveaux entre la disposition des données série et l'impulsion de flanc suivante.

3. Un système de transmission pour signaux multiplexés tel que revendiqué à la revendication 1, comprenant en outre des moyens (27) pour obtenir des signaux multiplexés devant être transmis par modulation supplémentaire des signaux modulés en fréquence par une seconde impulsion carrée.

4. Un système de transmission pour signaux multiplexés tel que revendiqué à la revendication 3, dans lequel le premier groupe d'impulsions carrées contient un signal de commutation de têtes vidéo et un signal de commutation de têtes audio, la seconde impulsion carrée contient des informations pour commuter des amplificateurs de têtes prévus sur le substrat de la partie des têtes rotatives d'un magnétoscope, et dans lequel les informations de mode contiennent des informations pour commuter divers commutateurs prévus sur le substrat de la partie des têtes rotatives.

5. Un système de transmission pour signaux multiplexés tel que revendiqué dans une revendication précédente quelconque, caractérisé en ce que les données parallèles comprennent les informations d'attribut de flanc et les informations de mode comportant des informations de commutation pour commuter les systèmes de têtes d'un système à plusieurs têtes.

6. Un système de transmission pour signaux multiplexés tel que revendiqué à la revendication 5, dans lequel au moins une des impulsions carrées comprend un signal de commutation de têtes vidéo, et dans lequel le système à plusieurs têtes comprend un système à plusieurs têtes audio.

7. Un système de transmission pour signaux multiplexés tel que revendiqué à la revendication 5 ou 6, dans lequel au moins une des impulsions carrées comprend un signal de commutation de têtes audio, et dans lequel le système à plusieurs têtes comprend un système à plusieurs têtes vidéo.

8. Un système de transmission pour signaux multiplexés tel que revendiqué à la revendication 5, dans lequel les impulsions carrées comprennent un signal de commutation de têtes vidéo et un signal de commutation de têtes audio qui sont appliqués de manière sélective aux moyens de production des trains d'impulsions de flanc.

9. Un système de réception pour signaux multiplexés comprenant :

des moyens (31) pour recevoir un signal multiplexé transmis à partir d'une partie de transmission ;

caractérisé en ce que le système comprend :

des moyens (33, 34) pour démoduler, par démodulation de fréquence, un signal à quatre niveaux à partir du signal multiplexé reçu ;

des moyens (35) pour décoder des données séries et un train d'impulsions de flanc à partir du signal à quatre niveaux;

des moyens (36) pour reproduire des informations d'attribut de flanc et des informations de mode en utilisant les données séries ; et

des moyens (37) pour reproduire des impulsions carrées formant un premier groupe d'impulsions carrées utilisant les informations d'attribut de flanc.

10. Un système de réception pour signaux multiplexés tel que revendiqué à la revendication 9, dans lequel les moyens de démodulation du signal à quatre niveaux comprennent des moyens (34) pour produire un niveau de référence en bloquant un niveau pendant une période dans laquelle il n'existe aucune donnée série du signal à quatre niveaux démodulé en fréquence, à un niveau constant.

11. Un système de réception pour signaux multiplexés tel que revendiqué à la revendication 9, comprenant en outre des moyens pour extraire une seconde impulsion carrée par démodulation d'amplitude du signal reçu.

12. Un système de réception pour signaux multiplexés tel que revendiqué à la revendication 11, dans lequel le premier groupe d'impulsions carrées contient un signal de commutation de têtes vidéo et un signal de commutation de têtes audio, la seconde impulsion carrée contient des informations pour commuter des amplificateurs de têtes prévus sur le substrat de la partie des têtes rotatives d'un magnétoscope, et dans lequel les informations de mode contiennent des informations pour commuter divers commutateurs prévus sur le substrat de la partie des têtes rotatives.

13. Un système de réception pour signaux multiplexés tel que revendiqué dans une des revendications 9 à 12, comprenant en outre :

des moyens pour détecter au moins un flanc d'impulsions carrées parmi les impulsions carrées ci-dessus ; et

des moyens pour délivrer les informations pour commuter divers commutateurs, contenues dans les informations de mode reproduites, à

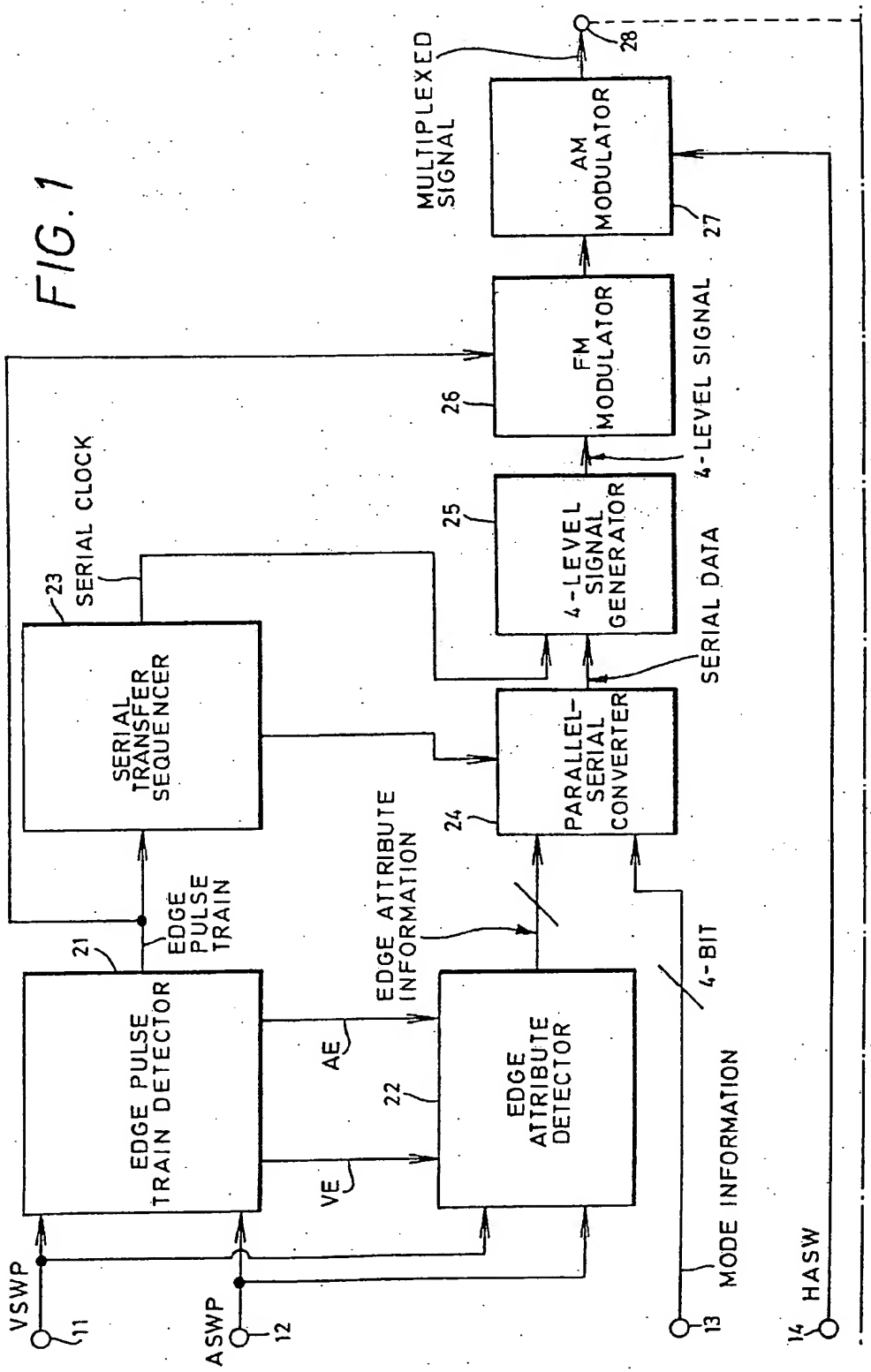
une synchronisation de détection de flanc dans une période de chevauchement d'un système à plusieurs têtes.

14. Un système de réception pour signaux multiplexés tel que revendiqué à la revendication 13, dans lequel au moins une des impulsions carrées comprend un signal de commutation de têtes vidéo, et dans lequel le système à plusieurs têtes comprend un système à plusieurs têtes audio.

15. Un système de réception pour signaux multiplexés tel que revendiqué à la revendication 13 ou 14, dans lequel au moins une des impulsions carrées comprend un signal de commutation de têtes audio, et le système à plusieurs têtes comprend un système à plusieurs têtes vidéo.

16. Un système de réception pour signaux multiplexés tel que revendiqué à la revendication 13, dans lequel les impulsions carrées comprennent un signal de commutation de têtes vidéo et un signal de commutation de têtes audio qui sont appliqués de manière sélective aux moyens de détection de flanc.

FIG. 1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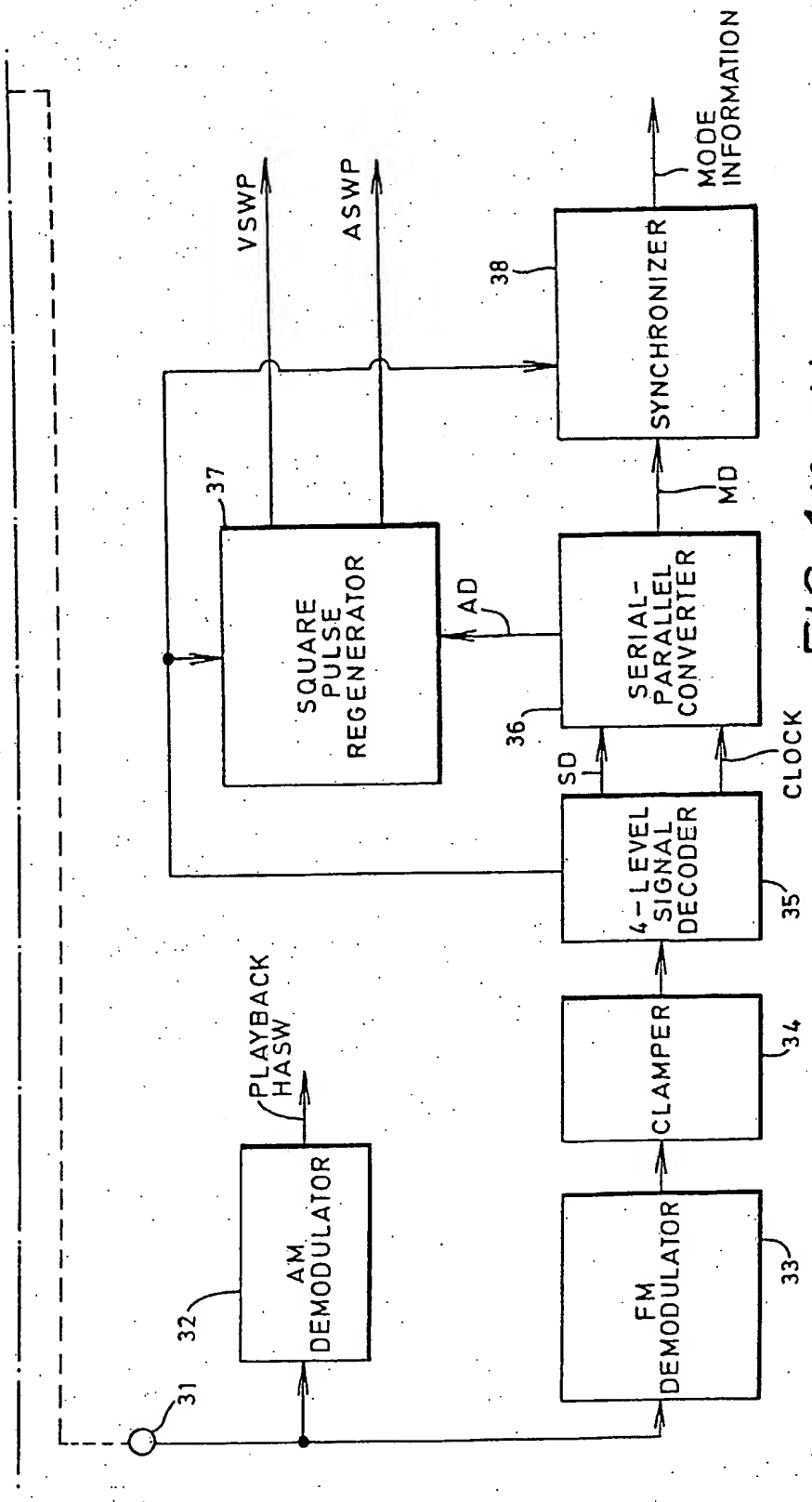
ASWP
12
EDGE PULSE TRAIN DETECTOR
21
EDGE PULSE TRAIN
SERIAL TRANSFER SEQUENCER
23
SERIAL CLOCK
AE
VE
22
EDGE ATTRIBUTE DETECTOR
EDGE ATTRIBUTE INFORMATION
24
PARALLEL-SERIAL CONVERTER
4-BIT
MODE INFORMATION
13
SERIAL DATA
25
4-LEVEL SIGNAL GENERATOR
4-LEVEL SIGNAL
26
FM MODULATOR
27
AM MODULATOR
MULTIPLEXED SIGNAL
28
HASW
14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AM DEMODULATOR
PLAYBACK HASW
33
FM DEMODULATOR
34
CLAMPER
35
4-LEVEL SIGNAL DECODER
SD
CLOCK
36
SERIAL-PARALLEL CONVERTER
AD
37
SQUARE PULSE REGENERATOR
MD
38
SYNCHRONIZER
VSWP
ASWP
MODE INFORMATION

FIG. 1 (Contd.)

FIG.2

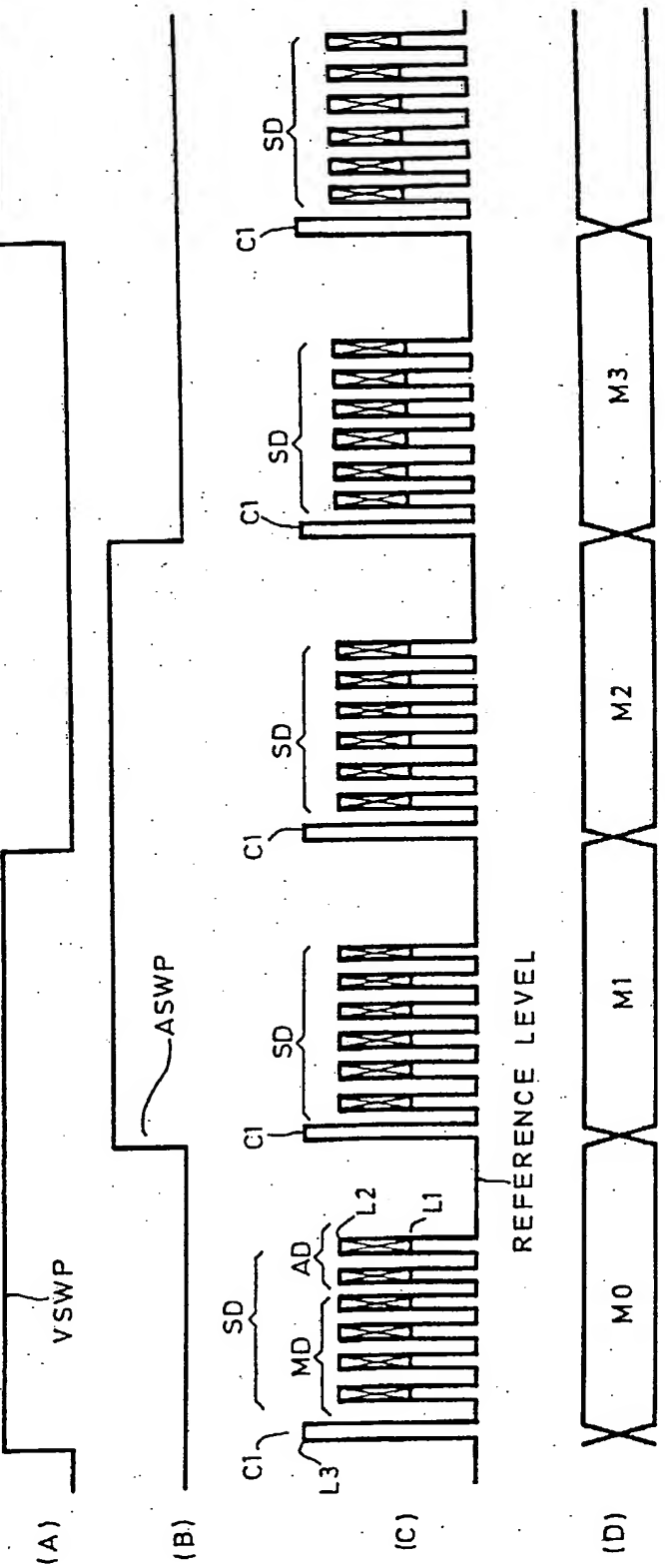
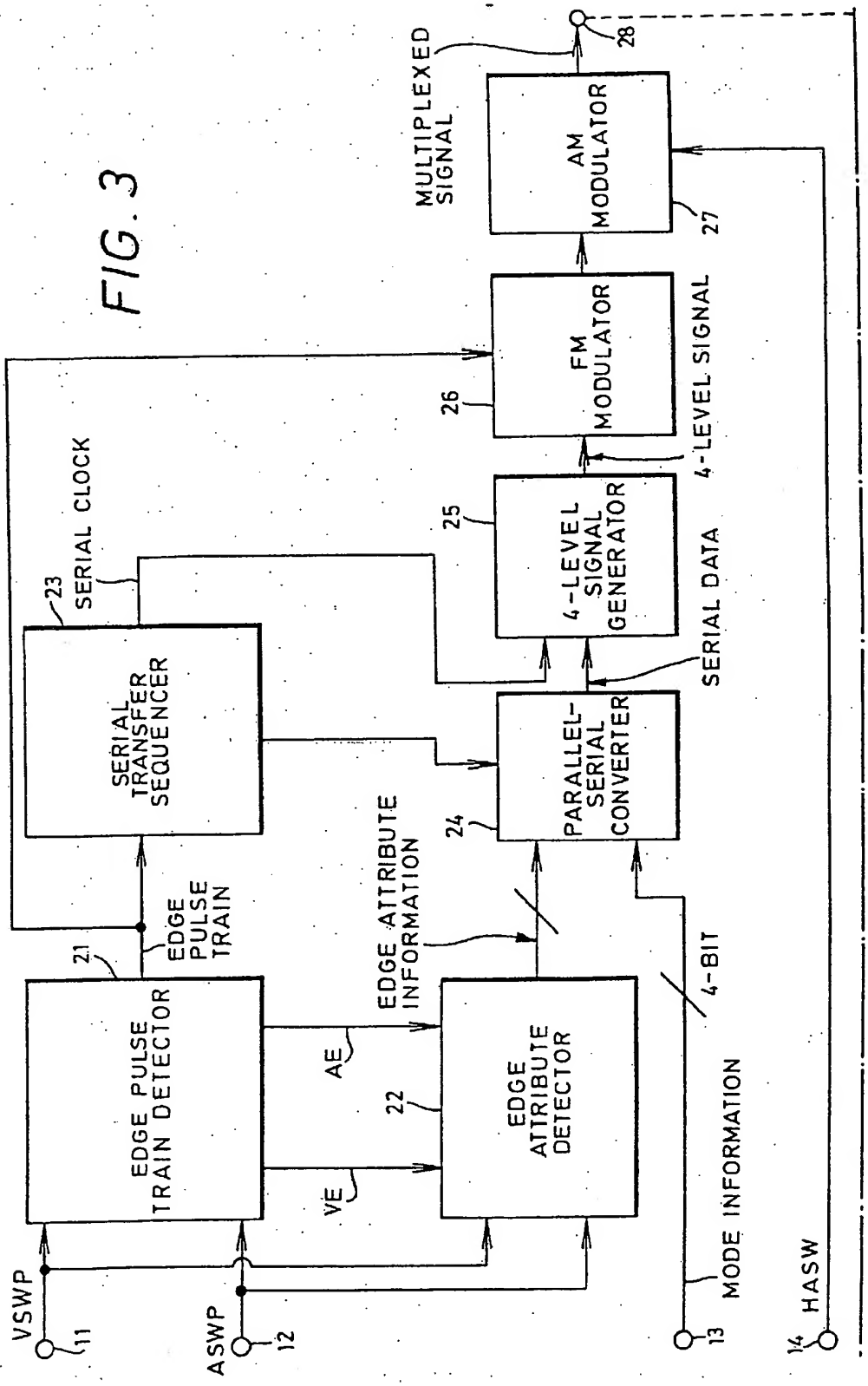


FIG. 3


VSWP
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ASWP
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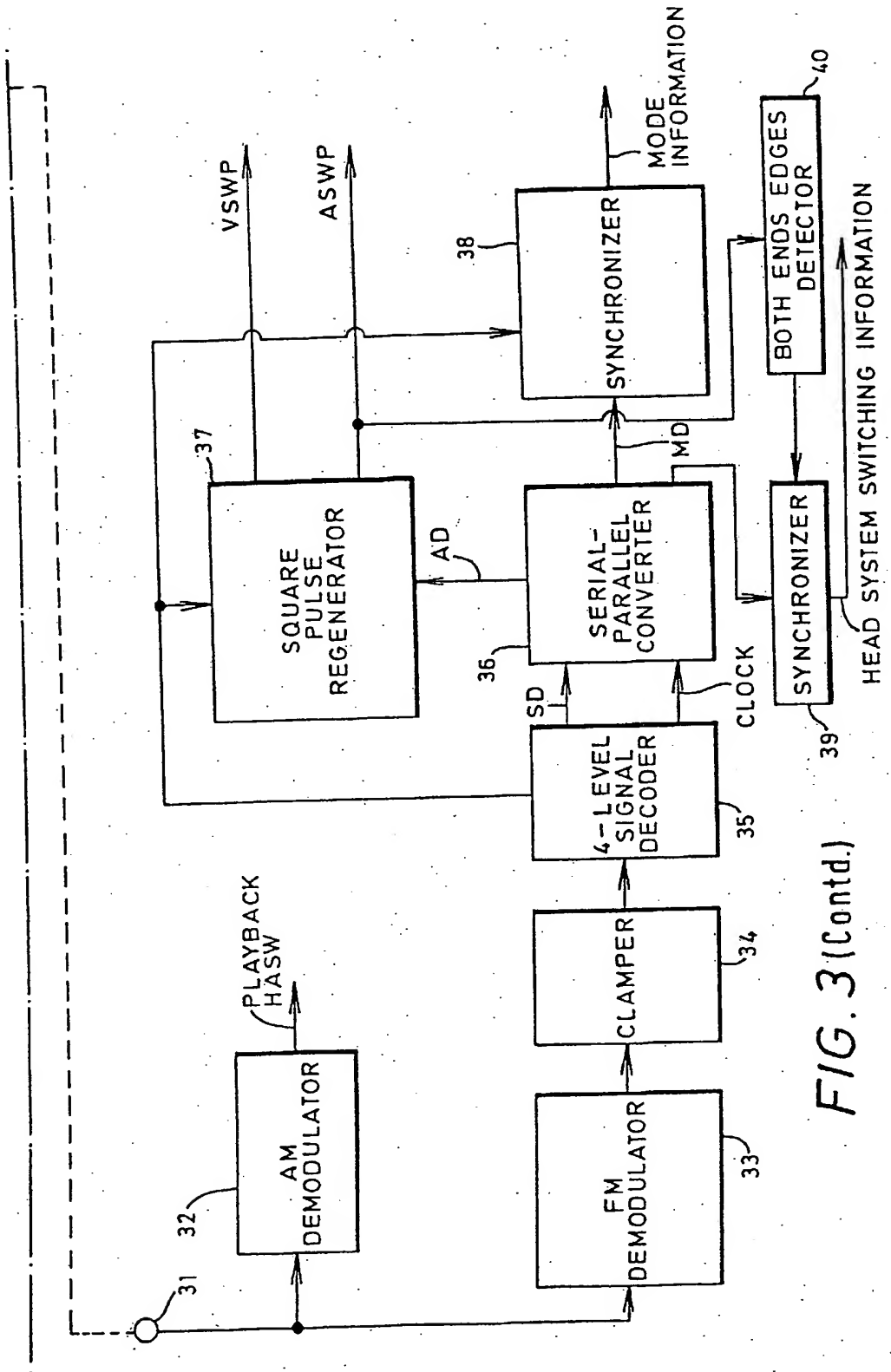
EDGE PULSE TRAIN DETECTOR
21
EDGE PULSE TRAIN
SERIAL TRANSFER SEQUENCER
23
SERIAL CLOCK
AE
VE
EDGE ATTRIBUTE DETECTOR
22
EDGE ATTRIBUTE INFORMATION
PARALLEL-SERIAL CONVERTER
24
4-BIT
MODE INFORMATION
13
HASW
14
4-LEVEL SIGNAL GENERATOR
25
SERIAL DATA
FM MODULATOR
26
4-LEVEL SIGNAL
AM MODULATOR
27
MULTIPLEXED SIGNAL
28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FM DEMODULATOR
34
CLAMPER
35
4-LEVEL SIGNAL DECODER
SD
CLOCK
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SERIAL-PARALLEL CONVERTER
AD
37
SQUARE PULSE REGENERATOR
VSWP
ASWP
38
SYNCHRONIZER
MODE INFORMATION
MD
40
BOTH ENDS EDGES DETECTOR
39
SYNCHRONIZER
HEAD SYSTEM SWITCHING INFORMATION

FIG. 3 (Contd.)

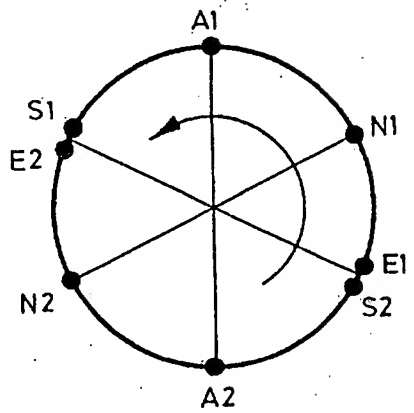

FIG. 4(A)

VIDEO MULTI-SYSTEM HEADS ARRANGEMENT

FIG. 4(B)

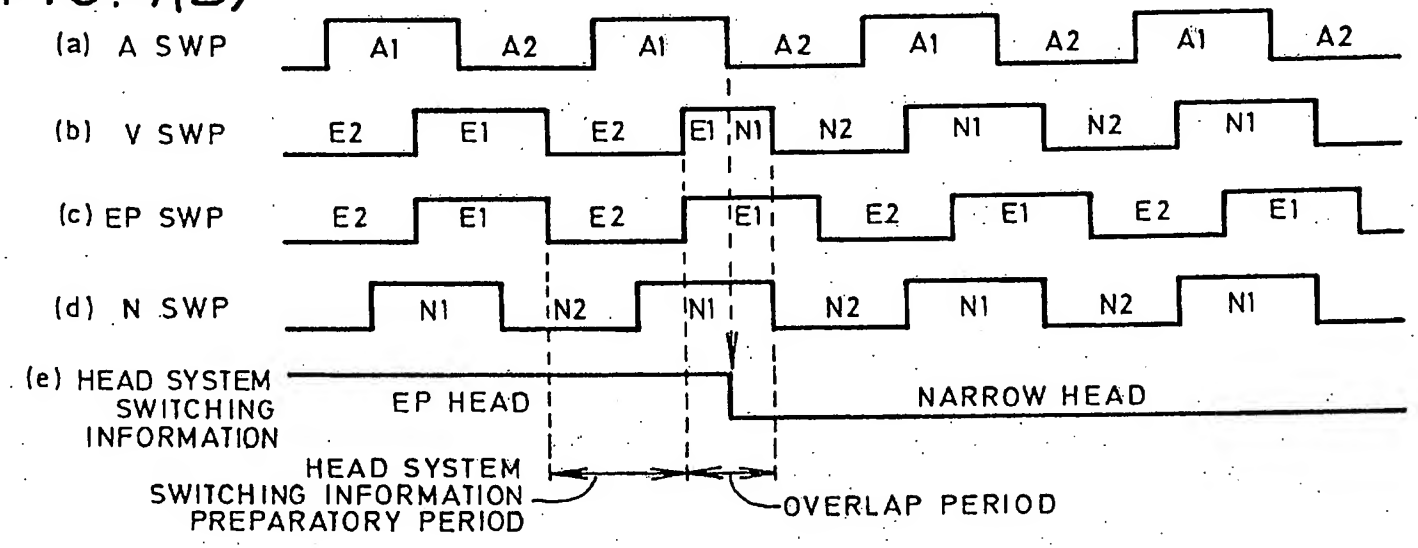

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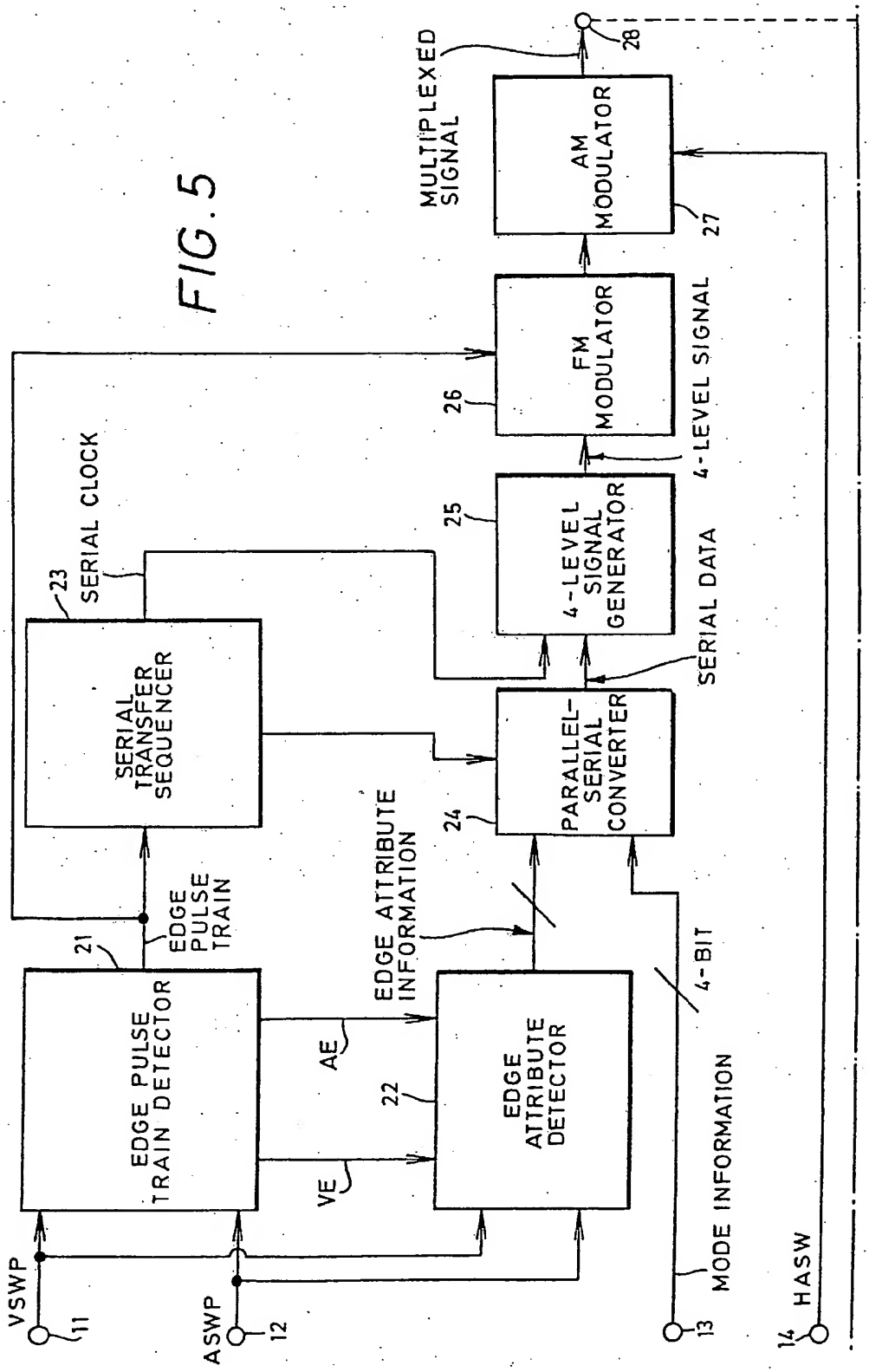
FIG. 5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ASWP
12
EDGE PULSE TRAIN DETECTOR
21
EDGE PULSE TRAIN
SERIAL TRANSFER SEQUENCER
23
SERIAL CLOCK
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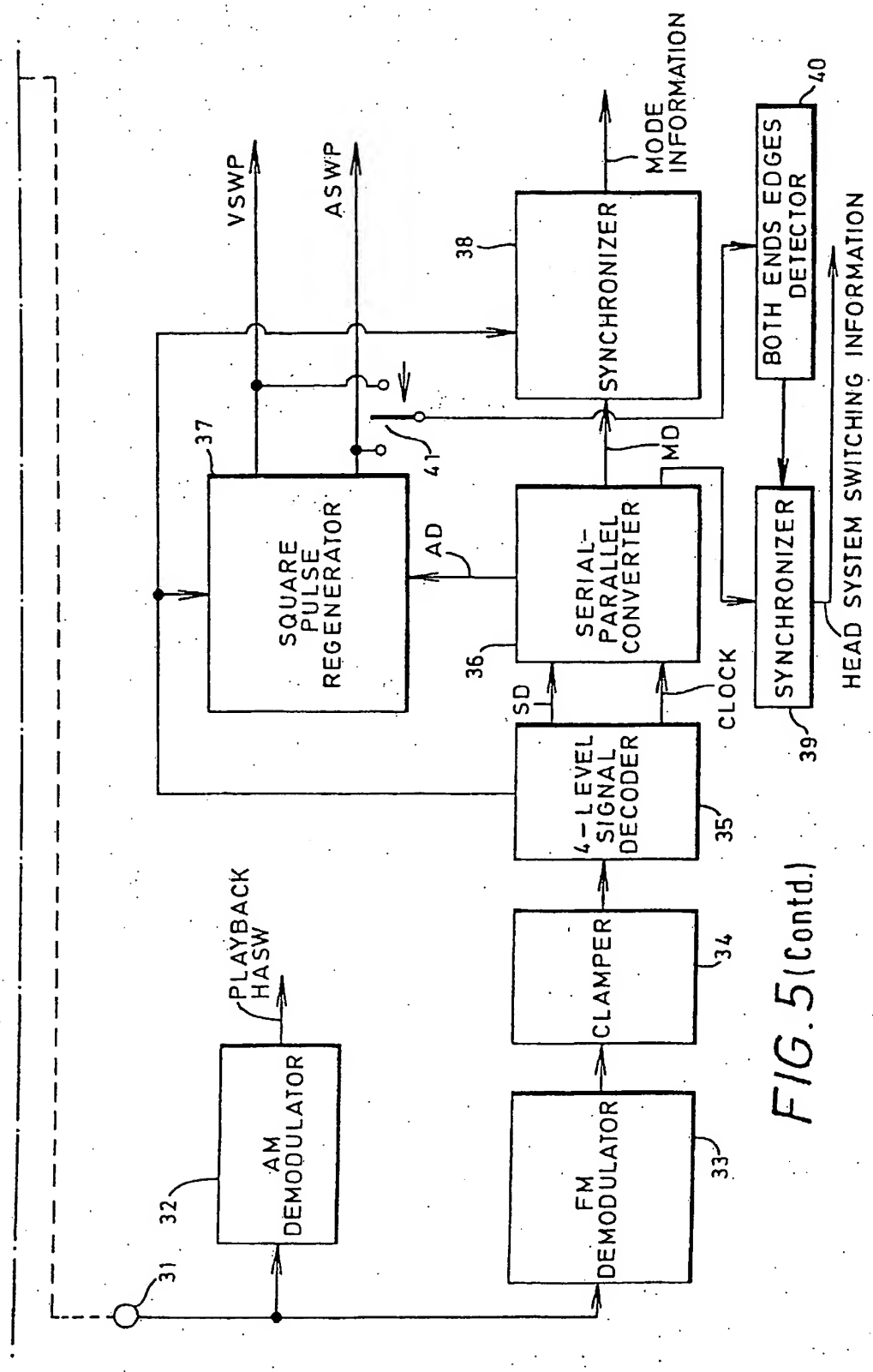
VE
22
EDGE ATTRIBUTE DETECTOR
EDGE ATTRIBUTE INFORMATION
PARALLEL-SERIAL CONVERTER
24
4-BIT
MODE INFORMATION
13
HASW
14
4-LEVEL SIGNAL GENERATOR
25
SERIAL DATA
FM MODULATOR
26
4-LEVEL SIGNAL
AM MODULATOR
27
MULTIPLEXED SIGNAL
28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AM DEMODULATOR
PLAYBACK HASW
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FM DEMODULATOR
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CLAMPER
35
4-LEVEL SIGNAL DECODER
SD
36
SERIAL-PARALLEL CONVERTER
CLOCK
AD
37
SQUARE PULSE REGENERATOR
VSWP
ASWP
41
38
SYNCHRONIZER
MODE INFORMATION
MD
40
BOTH ENDS EDGES DETECTOR
39
SYNCHRONIZER
HEAD SYSTEM SWITCHING INFORMATION

FIG. 5 (Contd.)

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